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CONTENTS

The migratory locust in South America, by C. Logothetis . 33

Plant disease situation in the United States, by Paul R. Miller . 36

Two important tree borers in Israel, by H. Bytinski-Salz . . 38

Infestation control in rice, by S. S. Easter 40

Spiny bollworm of cotton in Iraq, by Robert L. Walker . . 42

Outbreaks and new records 43

Canada, by I. L. Conners
New Zealand, by G. A. H. Helson
Iraq, by J. Lewis Allison
Italy and Switzerland, by R. W. Jugenheimer

Plant quarantine announcements 45

Algeria, Canada, France, Hungary, Ryukyu Islands, Switzerland, United States of America.

News and notes 47

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FAO Plant Protection Bulletin

VOL. I, No. 3 A Publication of the DECEMBER 1952

World Reporting Service on Plant Diseases and Pests

The Migratory Locust in South America

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SOUTH American locust, *Schistocerca paranensis* Burm., the present plague of which began in 1943, is a menace to crop production in Argentina, Bolivia, Brazil, Paraguay and Uruguay. In 1950 there was some reduction in the intensity but it regained its strength in the following year and since then it has continued unabated.

The migratory locust in South America, in number and size of swarms, may even surpass in magnitude the locusts in other regions. Dense individual swarms covering 3,000 square kilometers are not uncommon, so their destructiveness needs no statistical proof.

Among the countries affected, Argentina suffers the most and consequently does most of the anti-locust work and pays the lion's share of control expenditure. Ever since 1949 locust swarms have been present continuously in that country and it appears to be true that Argentina is one of the major centres of locust breeding.

The locust situation in Paraguay and Bolivia is not very clear. Frequently large swarms enter the agricultural areas of these two countries, but usually the locusts confine themselves to the respective Chaco provinces which are very thinly populated and are of relatively minor agricultural importance. There are now a considerable number of large swarms in the cultivated areas of both countries, but infestation is not at its peak.

Brazil and Uruguay are at present free of locusts. At variable intervals they are invaded from neighboring territories, the last invasion having occurred from 1946 to 1949.

During a severe locust outbreak, the maximum area invaded includes the eastern part of Bolivia (provinces of Santa Cruz, Tarija, Chuquisaca, Cochabamba and Potosí), Paraguay (Departments of Chaco, Presidente Hayes, Concepción and Boquerón), Brazil (Matto Grosso, Rio Grande do Sul, Santa Catarina and Parana), the whole of Uruguay, and Argentina (as far south as the Territory of Chubut which is south of parallel 42°).

Origin of Locust Outbreaks

The greatest problem concerning the migratory locust in South America, as is true of other locusts, is the location of its permanent breeding grounds. Studies and observations of many years, based upon the movements of swarms rather than upon direct evidence, indicate that this species maintains itself permanently and produces the initial migratory swarms somewhere in the vast area comprising the Chacos of Argentina, Bolivia and Paraguay. It is suspected that the State of Matto Grosso of Brazil may also produce swarms occasionally. This whole area is very thinly populated or even uninhabited, lacks means of communication and transportation, and is partly desert and partly covered with bush and forest. During plague years, swarms from this suspected area disperse in all directions invading the surrounding territories.

One peculiar characteristic of this species, according to the observations made by the South American specialists, is that the insect has invariably been found to a greater or lesser degree, in its swarming or " gregaria " phase. It is claimed that this region is never entirely free from locust swarms. The fact that this locust has not yet been found in its non-swarming or " solitaria " phase has led to the belief that the phenomenon of phase transformation does not occur in this

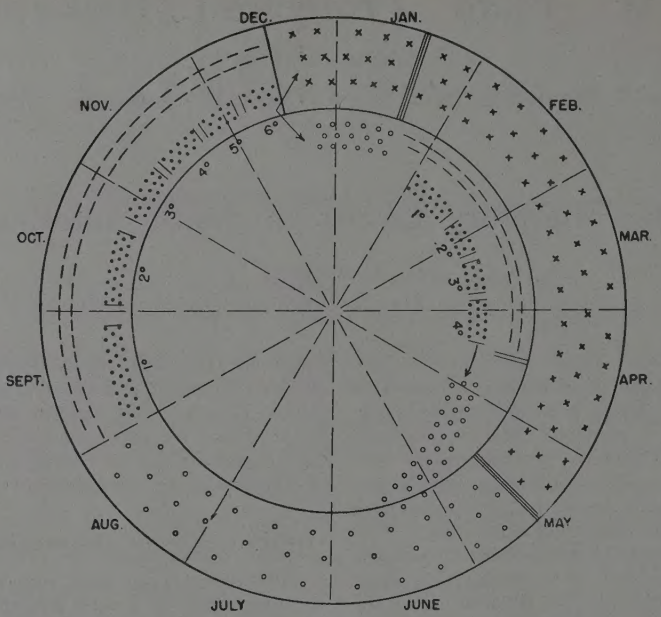

Fig. 1. Diagram showing the life cycle of the migratory locust (*Schistocerca paranensis*) in South America. Outer circle denotes the first generation and inner circle the second generation. X Immature adults in concentration. O Immature adults in dispersion. — Mature adults. ... Eggs and nymphs.

species. The one locust which was found in relatively small numbers and which has been considered as the solitary phase of *Schistocerca paranensis*, is now believed by few experts to be a different species known as *Schistocerca cancellata* (Serville) Scudder.

The question of phase manifestation is of the utmost importance, since a thorough understanding of this question will lead to a more modern and rational view of locust control, i. e. to prevent the locust outbreaks rather than to control them after their occurrence. The Permanent Inter-American Anti-Locust Committee is now concentrating its efforts on carrying out special studies which should throw much light on the subject.

Life Cycle

The South American migratory locust has two generations each year. The first or "invernante" generation is the main and more important one. The second or "estival" generation is of lesser importance being of smaller magnitude and which may not take place every year in all areas, depending upon climatic conditions. The annual life cycle of this locust is illustrated in Fig. 1.

First generation. Adults of this generation develop from eggs deposited from September to December. They appear in the latter part of December and continue their flight until the early part of the following December, reaching sexual maturity and commencing oviposition from early September. The adults of this generation live for 11 to 12 months and oviposition takes place through the invasion area.

Second generation. Instead of continuing their flight in the sexually immature stage, some of the adults of the first generation appearing in late December enter immediately into sexual maturity and lay eggs from early February to middle of April. The nymphs hatched from the eggs become adults

from early May onward and join the adults of the first generation. So swarms found from May to December belong to both generations.

Movements of Locust Swarms

Available data indicate that this locust has two major directional flights, i. e. concentration flight and dispersion flight.

Concentration flight. Upon commencing their flight, locust swarms of both generations produced throughout the vast invasion area concentrate in a relatively small zone of Argentinian territory comprising the provinces of Salta and Presidente Peron where they remain from late January until mid–May. During this period no swarms are found elsewhere in Argentina.

Dispersion flight. After the middle of May these winged locusts begin to fly in all directions and into the entire area from which the concentration flight originated. This flight continues until the latter part of August when the insects reach sexual maturity and commence laying eggs, thus completing their annual cycle. It should be noted that adults of the second generation remain mostly in the dispersion area where they are developed.

These two flights have been studied extensively for many years, and South American entomologists know the exact flight routes.

Control Campaigns

In recent years the countries which suffer from the ravages of this locust have been increasingly aware of its importance and have appropriated large sums of money for its control. Uruguay and Argentina, in particular, have up–to–date laws whereby the entire nation may be mobilized against the locust menace.

Most of these countries have extensive and well–organized control campaigns. The governments have utilized every insecticide application equipment available, varying from simple hand–operated dusters to helicopters and large airplanes. Of the newest insecticides, hexachlorocyclohexane (BHC) is generally used, but some governments are experimenting with even more recent insecticides. For economic and partly technical reasons Argentina has used mostly dinitro–ortho–cresol (DNOC) with excellent results.

Despite all efforts, the problem of combating the locust in South America is of such magnitude that the main control operations so far have been concentrated only against swarms approaching crops in rich farming areas. Such operations have succeeded in preventing heavy losses of crops during the last few years.

The governments, however, realize that their efforts, admirable as they may be, are merely minimum defensive measures, and that more extensive campaigns would require appropriations beyond their budgetary capabilities. For this reason, they are now diverting their attention from defensive measures to the more promising offensive control which involves finding permanent breeding grounds and suppressing future initial outbreaks. This is a long and difficult task but is the only logical approach to bring the locust problem to a successful solution, which the governments involved are determined to achieve.

The need for expanded regional cooperation has long been recognized and such cooperation was officially formalized with the signing of a special convention in 1946 in Montevideo by representatives of Argentina, Bolivia, Brazil, Paraguay and Uruguay. As a direct outcome of this convention, the Permanent Inter–American Anti–locust Committee was created in 1947 with Headquarters in Buenos Aires. The President is the Director of the Plant Protection Directorate of Argentina. The functions of this Committee are to:

(*a*) coordinate research;
(*b*) exchange information on swarm movements and development;
(*c*) search for the permanent breeding grounds;
(*d*) conduct research on chemical control;
(*e*) provide assistance to member countries in cases of emergency.

Thus far the Committee has been very effective in the exchange of information on swarm movements which is of the utmost importance to the countries concerned, and has commenced special studies in finding the outbreak areas. Lack of adequate funds has hitherto prevented the Committee from furnishing material assistance to the countries in need, but the national services nevertheless help one another to a considerable extent

Plant Disease Situation in the United States

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As a continuation of the previous series, these notes record the highlights of the current incidence of plant diseases in the United States, which may be of interest to other countries.

Evident Specialization in Dwarf Bunt

Hitherto all wheat varieties, including Rex and Elmar, with the Martin factor for bunt resistance have been highly resistant to dwarf bunt throughout the Pacific Northwest. Consequently, a heavy infection observed in Rex wheat in Idaho in the summer of 1952, and lesser amounts seen later in two fields of Elmar in the same locality, strongly indicate the presence of a new pathogenic race of dwarf bunt that attacks varieties with the Martin factor.

Only one pathogenic race of *Tilletia caries* (DC.) Tul. causing dwarf bunt was recognized previously. It attacks varieties with the Turkey factor for bunt resistance. The Turkey factor is resistant to all the races of *T. caries* causing common bunt that are not controlled by the Martin factor. It is not known whether the new race of dwarf bunt is controlled by the Turkey factor.

Aside from pathogenicity, the presumably new race differs from the long established more prevalent race by causing less dwarfing of the plants and less stimulation of tillering.

Occurrence of dwarf bunt on certain forage grasses in Union County, Oregon (see last month's report) is a further evidence of the existence of more than one pathogenic race in the Pacific Northwest. Heavy infection of Tualatin oat grass (*Arrhenatherum elatius* var. *bulbosum*) was reported in several fields, each having a previous record of dwarf bunt in wheat. In one of these fields dwarf bunt occurred on volunteer wheat plants also, indicating either common susceptibility of the two hosts or the presence of two distinct pathogenic races in the same field. On the other hand, there was no dwarf bunt in an Idaho field of this oat grass also growing on soil with a record of wheat dwarf bunt, but several volunteer wheat plants in this field were affected, suggesting in this case differential susceptibility of wheat and the oat grass. If the dwarf bunt on both oat grass and wheat in Oregon is caused by one race it apparently differs from the dwarf bunt race in the Idaho field by the differential response of Tualatin oat grass.

Experimental proof is lacking, but these observations indicate that more than one pathogenic race of *Tilletia caries* causes dwarf bunt of winter wheat in the Pacific Northwest. This has obvious implications in relation to breeding dwarf bunt resistant winter wheat varieties.

Dwarf Bunt Attacking Rye

During a survey for wheat bunt, several rye plants affected by dwarf bunt were found in a Utah wheat field. Common bunt is known to attack rye but this is apparently the first time that dwarf bunt has been observed on it. Effects ranged from complete infection with characteristic dwarfing and increased tillering to one or two infected spikes of about half the normal height. Sori of dwarf bunt on rye are of the same shape and consistency as on wheat; the spores also are like spores of dwarf bunt on wheat. Dwarf bunt has usually been considered to be a race of the common bunt, *Tilletia caries* (DC.) Tul., but it has recently been separated as a species, *T. brevifaciens* G. W. Fischer.

Pepper Leaf Spot in Georgia

Leaf spot caused by *Cladosporium capsici* (Marchal and Steyaert) Kovachevsky was observed in Georgia during September, in a

small field of California Wonder bell peppers (*Capsicum*). The entire field was seriously affected. Some plants were completely defoliated and all of the remaining plants bore some leaves with large spots or with the entire under side covered with the dark, velvety mycelial growth of the fungus. Late appearance of the disease, however, prevented severe damage of the fruits. Peppers had been grown in an adjoining field last year, but had never before been planted in this particular field. The source of the seed could not be determined. Apparently this is the first report of occurrence of this fungus in the United States.

New Peach Rot in Louisiana

A fungus consistently isolated from diseased peach fruit and stems obtained from a few northern Louisiana orchards was tentatively identified as a species of *Diplodina*.

Symptoms on the fruit at first were similar to those caused by the brown rot fungus *Monilinia fructicola* (Wint.) Honey. Under moist conditions the earliest indications were small circular brown spots, which rapidly increased in diameter until the whole fruit was finally involved. The spots did not become sunken but were soft and watery. Shriveling occurred in concentric rings but was not evident until the spots were much enlarged.

In the folds of the host epidermis appeared numerous brown stromatic masses which soon turned black and became covered with a light grey mycelial matting that sometimes resembled spore masses of *Monilia* in texture and appearance. Within the black stromata protruding through the host epidermis were imbedded numerous pycnidia, which separated out singly upon pressure. Later, grey masses of conidia exuded from the pycnidia. Finally the fruit became dry and shrivelled or mummy-like.

The fungus grew rapidly on potato-dextrose agar and fruited abundantly within seven days. Inoculated fruits, both wounded and unwounded, were placed in a moisture chamber with uninoculated fruits as controls. Within 24 hours spots appeared on the inoculated peaches and about five days later they were almost completely rotted. The wounded fruits showed spots not only at the needle punctures but in uninjured locations as well. The organism was re-isolated from artificially inoculated fruits.

It is possible that the brown rot caused by this fungus has been confused with the common *Monilinia* (*Sclerotinia*) brown rot, which it resembles in some respects, and that the fungus has actually been present unnoticed for some time. In any event it is evident that its demonstrated causal association with a fruit disease of peaches makes it potentially, if not already, important in the northern Louisiana peach growing section.

Two Important Tree Borers in Israel

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Two tropical tree borers affecting chiefly figs and *Eucalyptus* were introduced in the last decade into Israel where they have caused much concern. Intensive investigations have been carried out for several years in order to determine their life cycles under local conditions and to devise effective methods for their control. This paper reports briefly the biology and present position of these pests.

Fig Borer

The fig or mango borer, *Batocera rufomaculata* de Geer, is a tree pest, occurring in tropical regions from the Malay Archipelago through India, Ceylon, Madagascar, Reunion and Mauritius to East Africa. It has been accidentally introduced into some of the West Indian Islands. It reached Israel probably in the late forties. In 1950 one specimen was reported, and during 1951 and 1952 some 30 specimens were collected, all on fig trees. After its host relationship became known, a survey in fig groves was made.

It was found that up to October 1952, the pest was still confined to the Carmel range, occurring, roughly speaking, over a triangle from Haifa south to Ghedera, and from there north–eastwards through Wadi Ara to Megiddo.

Batocera rufomaculata is a longicorn beetle with a body length of 5–6 cm. It is light greyish brown with a yellow lateral band on the thorax and abdomen. It can be recognized easily by the two kidney–shaped red spots on the prothorax.

The adult emerges from June to August and lives for several months. It is nocturnal, hiding during the day in holes or crevices of the bark, in the forks of larger branches or on the tree trunk near the ground. It is active at night, flying considerable distances with great noise and is attracted by light. If disturbed, the beetle may produce a stridulating noise which, in Mauritius, gave it the name of violin borer. The adult feeds on the bark of young fig branches and on young immature fruits.

The average number of eggs laid during a period of seven weeks was 2.5 nightly. The egg is laid singly in a semilunar incision, about 2.5 cm. long, cut by the female into the bark. The slit is filled with shavings glued together by a secretion from the genital glands.

In August the larva hatches after nine to ten days and immediately bores through the bark to the phloem where it starts feeding. It feeds for about three months under the bark, reaching a length of 6–7 cm. and destroying 170 to 220 square cm. of the cambium. It then enters the wood, where it continues to feed until pupation. The shavings are thrown out intermittently from the galleries and in heavily infested trees virtually cover the ground around the stem. The shavings are very characteristic, reddish brown, coarse and containing bits of plant tissue up to 2 cm. long.

The adult emerges after about one year through a clean, completely circular exit hole 18–23 mm. in diameter. These holes, with the coarse frass indicate clearly that a tree is or has been infested.

The larva develops only in the stems of older trees or in branches of a diameter exceeding 8 cm. It can attack perfectly healthy trees. If five to seven larvae feed at about the same height of the trunk, they may completely girdle it within two to three months and the tree will die. Even if only a few larvae are present, the tree will be weakened.

The beetle continues to oviposit on infested trees, which usually die within two to three years. The beetle never oviposits on dead trees with completely dried up bark as do other Cerambycid wood borers on figs. In most places only single trees were found to be infested, but no complete statistical survey was carried out. Near Sichron Jaa-

cob, however, among 20 trees about 30 per cent were infested and already dying.

Batocera attacks a great number of forest, ornamental and fruit trees in the tropics, many of which are important in Israel, for example, most species of *Ficus*, mango, papaya, *Erythrina*, and *Albizzia*. The beetle has not yet reached the mango-growing districts in Israel. However, laboratory breeding tests show that it develops in mango stems even more quickly than in fig wood.

The beetle is polyphagous, readily accepting as food the bark or fruits of the following trees: fig, sycamore, *Ficus nidida*, mango, avocado, guajava, mulberry, apple, pear, etc. On most of these trees, eggs are laid and hatched, but the larval development is much retarded. Probably figs and mango only will prove suitable hosts for the whole developmental cycle. Biological investigations in field and laboratory will continue.

As means of control we recommend at the moment:

(*a*) sanitation of fig groves, such as cutting down and burning of heavily infested trees or branches;
(*b*) cutting out of individual larvae when they are still feeding below the bark;
(*c*) placing a few crystals of paradichlorobenzene into the entrance holes of the wood and closing them with a plug of cotton wool and tree wax or moist soil.

Eucalyptus Borer

The Eucalyptus borer, *Phoracantha semipunctata* Fabr., is a native of Australia, where it is found not uncommonly on wild *Eucalyptus*, but where it is chiefly known as a pest attacking felled timber. This beetle was introduced into New Zealand, South Africa, Argentina and Chile, and reached Israel probably in the early forties. It was first observed in 1945, and a survey in 1946 showed that it was already present in all regions where Eucalyptus trees were grown, south to Ghedera. In most groves a number of standing trees were found killed. From 1949 to 1952 it spread southwards into the Negev and Wadi Arabah, transported in infested Eucalyptus logs used for construction purposes. A detailed account by the writer and Neumark of the biology of the beetle will appear in the Proceedings of the IXth International Congress of Entomology, 1951.

Since the Conference, studies on the economic status of this pest have been continued. Although every felled tree is attacked within 48 hours during the summer, it now seems probable that entirely healthy standing trees are not sufficiently attacked to cause serious damage to groves. Repeated inoculations of healthy trees with eggs or larvae never succeeded, as the larvae were always killed by exuding gum. But trees in a physiologically weak condition, either due to unsuitable soil conditions or excessive drought, may be attacked even when external signs of weakness have not become visible. It was also reported in South Africa that attacks on standing trees were more severe in years of drought.

Trees from five to twelve years old usually succumb to the first attack, as the cambium is destroyed through girdling by the larvae within a few months. Older trees are weakened and succumb to repeated attacks.

In breeding experiments at two constant temperatures, two overlapping generations were obtained: one from March to August, the second from July to April; but adults and larvae may be found almost throughout the year. Larvae and adults become inactive at temperatures below 12° C.

As methods of control we recommend at the moment:

(*a*) felling of timber during the winter, when the beetles are inactive;
(*b*) during summer the use of trap trees, which should be barked or burned after one month, i. e. before the larvae penetrate the wood.

Infestation Control in Stored Rice

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Relatively little attention has been given to the problems of rice storage as compared with the extensive studies which have been made to improve the storage of wheat and maize. It is likely that much of this neglect is due to the usual rapid turnover of rice, which often has two or three crops per year and therefore a short storage life, and to the lack ot technically trained personnel in areas of heavy rice production and consumption. Available data, however, show clearly that storage losses of rice caused by insects, tungi and rodents, are frequently very high. Closer studies are likely to disclose losses now being unnoticed.

Infestation in Stored Rice

The insects which attack stored rice are well-known and universally distributed. Greatest losses occur in the milled rice which is most susceptible to damage except when extremely dry. There is a mistaken belief that parboiled milled rice is not subject to insect attack. This has been disproved frequently, but in trade circles the claim is still made. Parboiled milled rice is more resistant to insect attack than regularly milled rice, but still more susceptible than rice stored in paddy, assuming that the moisture content is comparable in all three forms.

The two most destructive insects of paddy rice are Angoumois grain moth (*Sitotroga cerealella* Oliv.), and lesser grain borer (*Rhizopertha dominica* F.), both of which can penetrate the rice husk. The Angoumois grain moth, however, is limited to infestations of the surface areas in bulk stored paddy since it cannot penetrate deeper than about 12 in. because of its fragile body. The rice weevil (*Sitophilus oryza* L.) is not a serious pest of paddy rice but causes the greatest losses in milled rice. It is frequently found as a secondary pest in paddy, entering through the exit holes of the grain moth. A number of other insects are found in milled rice but are relatively unimportant.

Excessive moisture causes heating and moulding of both paddy and milled rice. Usually rice is harvested with a moisture content above 20 percent and must be dried for safe storage generally to about 14 percent, varying somewhat with local conditions.

Rodents, especially rats, may cause serious damage to rice not only because of the amount they devour, but also because of damage to bags and the fouling of the rice. The species of rat varies with the locality.

Some control of insects and rats has been reported in the Far East, but it is impossible to say how extensively these control measures have been applied. It can be safely stated that much rice now being wasted could be saved at little cost. Emphasis on the control of pests has been on the use of chemicals rather than on good management, a much cheaper project which should include rotation of stocks, milling on demand, bulk storage of paddy, controlled drying to safe moisture content and, above all, improved storage facilities.

Methods of Storage

Methods of rice storage vary in different countries. Almost universally farmers store rice for home consumption in paddy and mill it when needed for food. Simple home-made containers may be used or the rice may be stored unthreshed in the head. Thus full advantage is taken of the resistance of the unhusked rice to insect attacks or to rapid changes in moisture content after it is dried.

Most of the losses do not occur on the farms but, instead, in the large stocks of rice collected for the needs of the cities or for export. It is these large stocks that should receive first attention in order

to reduce losses, for many faults are usually found in existing types of storage.

No single formula for infestation control can fit all conditions of rice storage. Nevertheless, a few basic principles are universally applicable. These principles will be discussed at a technical meeting on rice storage, to be convened by FAO in Bangkok, in December 1952.

Recommendations for Infestation Control

Abundance of insects and rodents is usually the result of a basic flaw in the storage system. Emphasis, therefore, should not be placed on methods of direct insect or rodent control, disregarding the more basic factors which presently provide ideal conditions for the pests. It is not unusual to find, for example, that insect control is attempted with fumigants in a storage area where there is no authority to prevent heavily infested rice from being stacked against the rice just fumigated. Frequently all management control is in the hands of non-technical men, who may accept as inevitable the moderate losses which can be equalised by increasing selling prices.

If work is to be initiated towards reduction of storage losses, the following recommendations, with minor modifications, will furnish a sound basis for operations under practically any conditions.

1. **Recognizing storage as a technical problem.** The solving of such a problem requires technically trained men.

2. **Preventing losses in concentrated stocks.** Primary efforts should be directed at the concentrated rice stocks where the major losses are found.

3. **Store rice in paddy.** Storage of milled rice, except for very short periods, should be avoided without sound technical justification. Milling rice only as needed should be the established practice.

4. **Bulk storage and handling.** The traditional storage and handling of rice in costly bags favors insect attacks and harbours rodents. Bulk storage and handling, of course, cannot be accomplished immediately where sack storage is prevalent, but it should be the ultimate goal of improved storage.

5. **Introducing controlled drying.** This could be accomplished in small installations after studies of cost, quality and processing.

6. **Improvement of management.** Management is a broad term and often misunderstood in regard to control of losses. Seldom does the trader or non-technical administrator recognize the value of simple means in controlling or reducing losses, such as the following:

(*a*) In insect and rodent control the most important factor is always one of sanitation or cleanliness. No infested material should be left around to spread infestation.
(*b*) There should always be an identification of the separate lots of stored rice to show origin and time of arrival.
(*c*) There should be a regular rotation of stocks in storage with the oldest always moving first for sale or consumption.
(*d*) Infested rice should be disposed of and not be left in storage to infest new stocks.
(*e*) Incoming infested stocks should not be allowed in storage with clean stocks.

7. **Direct control of infestation.** After action along the lines mentioned above has been initiated, there will be time for direct control of insects and rodents. Properly constructed storage facilities should do much in themselves to control rodents. Proven measures for insect control should be adapted to the needs of the areas concerned, but should be carefully scrutinized to determine if they are justified.

Spiny Bollworm of Cotton in Iraq

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THE spiny bollworm, *Earias insulana* Boisd., is a major pest of cotton in all the cotton-growing countries from Thailand and India west to the Mediterranean Sea, and in the whole continent of Africa from Morocco extending to Madagascar. It has also been reported from Spain and Sicily, and found once in Brazil.

Host Range

In Iraq the spiny bollworm is a grave menace to both the native Iraqi or Indian cotton (*Gossypium herbaceum* L.) and the more widely cultivated American cotton (*G. hirsutum* L.). It also attacks a number of other malvaceous plants, including hollyhock (*Althaea rosea* L.), Deccan hemp (*Hibiscus cannabinus* L.), okra (*H. esculentus* L.), Chinese hibiscus (*H. rosa-sinensis* L.), little mallow (*Malva parviflora* L.) and Manchurian jute (*Abutilon avicennae* Gaertn.), which is grown in Iraq experimentally. Aside from ratoon cotton, hollyhock is the most important host of *Earias insulana*, for it is an effective carrier of the pest during the spring until seedling cotton becomes available.

Losses

According to information obtained from the agricultural officers in various liwas and from the Iraqi Ministry of Agriculture, the losses in cotton yield caused by this destructive pest in some years reach considerable proportion. It is stated that in 1951 infestations of this insect were so high that a complete loss in yield resulted on many farms and no attempts were made by these farmers to harvest their crop which was turned over to livestock for grazing. Reliable figures or estimates of the losses, however, are not available, as no surveys have been carried out to determine the actual extent of damages.

This year, exten ive records have been taken of the infestations in the fields at the Abu Ghraib Experimental Farm, where insecticidal tests have been carried out by the author. These records, together with the limited observations made in Baghdad liwa, afford basis for making an estimate of the probable losses to be expected in Baghdad, which is the largest cotton growing area in Iraq.

The infestations of cotton squares in the untreated plots at the end of September varied from 40 to 70 percent. Boll infestations varied from 45 to 55 percent. During October the infestations will continue to rise. Conservative estimates of the losses in yield to be expected in these fields range from 40 to 80 per cent. Losses may be substantially increased in some fields as a result of the infection by boll rot fungi, *Rhizopus* spp. and *Aspergillus* spp., which gain entrance through the penetrations in the boll wall made by the spiny bollworm. The infection by these fungi invariably causes a complete loss of the boll which remains unopen. Examination of a large number of the intected bolls showed that almost every one had been penetrated by the bollworm, indicating a constant association of the fungus infection with insect feeding.

Chemical Control

Intensive field experiments are being carried out this year at the Abu Ghraib Experimental Farm to determine the efficiency of various insecticides for the control of the spiny bollworm. Several newer insecticides have shown considerable promise and Endrin and Dieldrin in particular have given better control than others. In one test, where treatments were started in the middle of August under conditions of a heavy infestation, an excellent top crop of cotton has been obtained during the second growth flush of the plants. But there was no bottom crop harvested in this field due to infestation prior to insecticidal applications. Conclusive statements, however, cannot be made until the end of the growing season.

Outbreaks and New Records

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Stem Rust in Western Canada

STEM rust has again become a factor in the production of wheat in parts of the Canadian Prairies since the appearance in 1950 of race 15 B in considerable amounts in the hard red spring wheat areas of the United States and Canada. In 1952, stem rust was first found in the Canadian Prairies on 30 June south of Winnipeg, Manitoba. The season was relatively favourable for increase and spread of the rust. At harvest heavy stem rust infection was largely limited to the Red River Valley and northward between Lake Manitoba and Lake Winnipeg. Moderate infection occurred across the rest of southern Manitoba and into southeastern Saskatchewan. Farther north and west only an occasional field of late wheat was affected.

Damage by stem rust in areas of heavy infection caused an average estimated loss of two to three percent to common wheat, but the damage to Western Canada's wheat crop as a whole was well under one percent.

The durum wheat crop suffered considerable yield losses. The damage was most severe in the Red River Valley, where a large part of the durum wheat is grown. Some fields appeared a total loss and about half the durum crop suffered losses of from 25 to 50 percent in yield and 4–5 lb. in bushel weight. Severe damage also occurred in late fields elsewhere in southern Manitoba and southeastern Saskatchewan.

Despite the prevalence of stem rust in areas indicated above, it should be noted that leaf rust was even more prevalent and caused considerably more damage to wheat than the stem rust. The leaves on much of the crop were destroyed two to three weeks before maturity. The loss from leaf-rust was estimated at five percent. All the commonly grown varieties are fully susceptible to the prevailing races of leaf rust. The one resistant common wheat is the variety Lee, to which a few small fields were sown.

Dwarf Bunt Found in Ontario

Dwarf bunt (*Tilletia brevifaciens* G. W. Fischer) was recently found in Cornell 595 winter wheat on two farms in the same district in York County, Ontario. Infection was very light. It appears that the seed was contaminated when it was first imported from New York State about 1946. Examination of over 50 samples of winter wheat, mostly commercial samples, failed to reveal any other cases of dwarf bunt but most of the commercial samples carried spores or even bunt balls of *Tilletia foetida* (Wallr.) Liro. Dwarf bunt also occurs in British Columbia, where it is largely confined to a small winter wheat area in the interior. The disease is unknown elsewhere in Canada.

New Zealand

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Oak Leaf Miner

The oak leaf miner (*Lithocolletis messaniella* Zell), which was reported in the last issue of this Bulletin, has become increasingly important during the intervening period, mainly in the province of Hawkes Bay. Whereas in other countries the host plants number about six, in New Zealand there are many hosts which have become infested recently by this pest. Among these hosts is the New Zealand red beach (*Nothofagus fusca*), an indigenous hardwood forest tree. The course of the epidemic and its economic significance will be reported in succeeding months.

Phytophthora on Tobacco

Phytophthora parasitica Dastur, which has a wide host range, causes a disease of tobacco, confined to a few fields in Motueka in the province of Nelson. This particular strain of the fungus appears to be particularly aggressive on mature tobacco plants.

New Records of Diseases

The new diseases recorded during September are those affecting ornamental plants, namely:

Leaf spots (*Septoria* spp.) on *Phlox* and *Garrya eliptica.*

Leaf blight (*Bacterium tardicrescens* McCulloch) on *Iris.*

It is unlikely that these diseases will ever become important.

Iraq

J. LEWIS ALLISON
Expanded Technical Assistance Program, FAO

Black Shank of Tobacco

Recently, Mr. Abdul Razzaq Al Adhami and the writer found black shank of tobacco in one field in the Surdash region of Sulimaniya liwa in Northern Iraq, causing considerable damage to a local Turkish tobacco variety. Dead and dying tobacco plants in this field showed typical symptoms of this disease and the causal fungus was isolated and identified as *Phytophthora parasitica* Dastur var. *Nicotiana* (Breda de Haan) Tucker. This is believed to be the first record of this disease in the Near East. Should it become widespread in the tobacco growing region, it will undoubtedly constitute one of the most serious diseases. A more extensive survey to determine the distribution and prevalence of this disease in Iraq will be carried out shortly.

Italy and Switzerland

R. W. JUGENHEIMER
Expanded Technical Assistance Program, FAO

Rough Dwarf of Maize

Rough dwarf was first discovered in 1938 on maize in Italy and was reported to be widespread during the period 1946 to 1949. In 1950 and 1951, however, it occurred only sporadically. When the writer toured the maize-growing countries in Europe in the summer of this year, this disease was observed rather commonly in the Canton of Tessin in southern Switzerland and in northern Italy, occasionally causing heavy damage. In northern Italy, a production field of seed maize of hybrid Wis.641AA was so badly damaged that it was not worthwhile harvesting it.

Rough dwarf appears to be a serious hazard to maize culture south of the Alps. Differences in resistance between available hybrids appear to be slight. The disease is characterized by the production of galls on the ribs of the leaves and is believed to be caused by virus. In Italy, intensive investigation of this disease is undertaken by Dr. L. Fenaroli of the Stazione sperimentale di Maiscoltura, Bergamo.

PLANT QUARANTINE ANNOUNCEMENTS

Algeria (France)

Order of 21 June 1952, as published in the Journal Officiel de l'Algérie No. 52, 27 June 1952, prohibits the importation into Algeria of seedlings, cuttings, scions and all parts of plants other than fruits of the Rutaceae family. Shipments for experimental purposes shall be allowed if a permit has been obtained from the Governor General in advance.

This Order supplements Orders of 8 November 1945 and of 30 September 1949, concerning the declared list of parasites against which the Algerian crop culture is to be protected.

Canada

Order in Council P. C. 3811 of 21 August 1952 amends further the Destructive Insect and Pest Regulations of 26 April 1949. It prohibits the importation from Europe of

1. plants with soil, sand, soil or earth, or packing material containing soil except from Holland and Belgium;
2. plants of *Salix*.

Among the import restrictions, plants or parts of plants of stone fruits from the United States should be accompanied by a certificate establishing freedom of certain specific virus diseases in the originating nursery or within one mile thereof. Maize or its products from the United States should be certified free from corn borer (*Pyrausta nubilalis*). Broom corn may be imported from countries other than the United States only between 16 August and the following 14 May, inclusive. Hop plants from England and Wales should be accompanied by a certificate that wilt disease (*Verticillium albo-atrum*) is not known to be present in the area where the plants were grown.

France

1. *Imports into Guadeloupe, Guyana and Martinique.* Three Orders dated 30 September 1952 were published in the Journal Officiel, Vol. 84, N°. 242, 9 October 1952, restricting the importation into the overseas departments of Guadeloupe, Guyana and Martinique of the following plant materials:

(*a*) Coffee, including seedlings, fruits, and unroasted coffee beans in all forms. A phytosanitary certificate is required attesting freedom from coffee berry borer (*Stephanoderes coffeae*) and coffee rust (*Hemileia vastatrix*) in the originating fields, or indicating, in the case of infestation by the borer, that the products have been disinfested.

(*b*) Cacoa, including seedlings, and cacao pods or beans and parts thereof. A certificate is required, attesting freedom from witches' broom disease (*Marasmius perniciosus*) in the originating fields and of virus diseases in the growing region.

(*c*) Sugarcane, including cuttings, seedlings and seeds. A certificate of selection control and of phytopathological inspection is required, attesting in particular freedom from virus diseases and of *Tomaspis saccharina* in the originating fields.

2. *Imports from countries infested by the San José scale.* Order of 2 October 1952. as published in the Journal Officiel Vol. 84, No. 242 restricts the importation into France, with the exception of Algeria, of living ligneous plants, parts thereof and their fresh fruits originating in countries infested by San José scale. These materials cannot be imported except through the declared customs offices and accompanied by a phytosanitary certificate in the form annexed to this Order. Importations for scientific purposes may be exempted from these restrictions if authorized by the Minister of Agriculture. This Order shall not affect the transit through Metropolitan France, if securely packed.

Hungary

Order No. 103 of 29 April 1951 provides for the establishment of the Plant Quarantine Service and contains a list of declared diseases and pests, the importation of which is prohibited, including the fall webworm.

Order No. 18,055 of 3 June 1951 contains provisions for regulating importation and exportation of plants and plant products. Phytosanitary certificates, in three languages, Russian, German or French, and the language of the originating country, are required for all imports except processed material, wood for fuel or industrial use and seeds for experimental purpose.

The importation of the following materials is prohibited:

(*a*) Potato, tomato, and eggplant: roots, stems, leaves.

(*b*) Potatoes from countries infested with fleabeetle (*Epitrix cucumeris*).

(*c*) Cotton seed and raw cotton from countries infested with pink bollworm (*Pectinophora gossypiella*).

(*d*) Plants, living parts thereof and plant products if not sealed, not accompanied by phytosanitary certificates, or with adhering earth or clods.
(*e*) Soil, stable manure, and compost.

The following plants may be imported only by special permit of the Ministry of Agriculture:

(*a*) Seed potatoes from countries infested with Colorado potato beetle (*Leptinotarsa decemlineata*).
(*b*) Plants or parts with earth balls.
(*c*) Plants from countries which do not have a plant protection service.

The following plants and plant parts may not be imported unless accompanied by a certificate establishing that the shipment or the growing area is free of the listed diseases and pests; or a certificate of disinfestation.

(*a*) Potatoes: flea beetle, Colorado potato beetle, potato wart (*Synchytrium endobioticum*); nematode (*Heterodera rostochiensis*); powdery scab (*Spongospora subterranea*); tuber worm (*Gnorimoschema operculella*).
(*b*) Cotton and cotton seed: pink bollworm; boll weevil (*Anthonomus grandis*); angular leaf spot (*Xanthomonas malvacearum*).
(*c*) Seed of alfalfa, timothy, *Satureia hortensis*, and clovers: dodder; the weed *Picris echiodes*.
(*d*) Flax: anthracnose (*Colletotrichum lini-colum*); pasmo, *Mycosphaerella linorum*; dodders.
(*e*) Onion and onion seed: smut (*Urocystis cepulae*).
(*f*) Sunflower seed: Broomrape (*Orobanche*).
(*g*) Peas, beans and other legumes (seed and green plant): halo blight (*Pseudomonas phaseolicola*); common bean blight (*Xanthomonas phaseoli*); bean wilt (*Corynebacterium flaccumfaciens*); bean weevil (*Acanthoscelides obtectus*); pea weevil (*Bruchus pisorum*).
(*h*) Vegetables and ornamentals: yellow disease of hyacinth (*Xanthomonas hyacinthi*).
(*i*) Lemon and orange fruit and seedlings: scale insects (*Lepidosaphes and Chrysomphalus*); Mediterranean fruit fly (*Ceratitis capitata*); citrus canker (*Xanthomonas citri*).
(*j*) Fruit: apple maggot (*Rhagoletis pomonella*); fall webworm (*Hyphantria cunea*); stone fruit viruses; San José scale (*Aspidiotus perniciosus*).
(*k*) Fruit tree seedlings: virus diseases; San José scale; fall webworm; crowngall (*Agrobacterium tumefaciens*) (must be certified as HCN-fumigated).
(*l*) Cuttings: vine louse (*Phylloxera vitifoliae*); infectious degeneration.
(*m*) Flowers (rooted or cut flowers), except personal bouquets.

Order No. 18,056 of 3 June 1951 designates the following places of inspection: Budapest, Biharkeresztes, Hegyeshalom, Hidasnémeti, Lökösháza, Mohacs, Szentgotthárd, Szob, and Zahony.

Ryukyu Islands

The Plant Quarantine Law of the Ryukyu Islands was issued 1 February 1952 and became effective 20 February 1952. It contains general provisions regarding import, export, internal- and through-shipment of plant materials.

Notifications on the Plant Quarantine Law Nos. 1–6 were published 24 April 1952. No. 1 designates ports of entry and inspection. No. 2 prohibits importation of fresh green beans, French peas, tomatoes, peppers, cucumbers, melon, watermelon, pumpkins from Australia, Burma, Ceylon, China, Formosa, Guam, Hawaii, India, Indonesia, Kenya, Malaya, Philippines, Siam, Saipan and Tinian, on account of melon fly (*Chaetodacus cucurbitae*). Nos. 3–6 cover domestic quarantines.

Switzerland

Federal Order of 26 September 1952 relative to the combat of chestnut blight, as published in the Recueil des Lois Fédérales No. 41, 2 October 1952, prohibits, among other provisions, the importation into Switzerland of the following plant materials:

(*a*) Chestnut seedlings and living parts thereof.
(*b*) Chestnut wood of any type, whatever the final uses.
(*c*) Other plants and other types of wood designated by the Department of Public Economy.

This prohibition may be derogated, if authorized by the Division of Agriculture and in compliance with certain conditions.

United States of America

Foreign Quarantine Notices containing miscellaneous amendments, as published in the Federal Register Vol. 17, No. 173, were issued 29 August 1952 and became effective 5 September 1952. By these amendments, regulations, formerly applied to the importation of the following plant materials into the Continental United States, now apply to Alaska, Hawaii, Porto Rico and the Virgin Islands as well:

(*a*) citrus nursery stock;
(*b*) citrus fruit;
(*c*) nursery stock, plants and seeds;
(*d*) fruits and vegetables;
(*e*) cut flowers.

NEWS AND NOTES

Sugar Beet Yellows Conference

Virus yellows of beet, which has spread to most countries in Western Europe, is particularly virulent this year in Federal Germany. Yields are reduced by anything up to 50 percent of the normal, and, in the case of heavily infested seed stocks, by as much as 75 percent.

Under the auspices of the European Plant Protection Organisation, a conference to discuss the position of this disease in Germany and if possible to agree to coordinated control measures in the European countries affected was convened in Cologne on September 26–27 by the German Plant Protection Service. Representatives of several European countries and of the International Institute for Sugar Beet Research were present.

Dr. Steudel, of the German Federal Biological Research Institute, discussed the promising results obtained in the course of large-scale experimentation with the systemic insecticide, Cystox. Dr. Schlösser, of the Sugar Beet Breeding Institute, reported on the progress in developing tolerant strains of beet. Coordination of effort in the different European countries was also explored during the Conference.

Locust Conference in Algiers

The first conference of countries within the Western Region of the Desert Locust was held in Algiers, 13–15 October 1952. At this conference, organized by FAO in consultation with the French Government, were represented: Algeria, French Morocco, Tunis, French West Africa, French Equatorial Africa, Togo, French Cameroons, Nigeria, Anglo-Egyptian Sudan, Spain, the French Ministries of Foreign Affairs and France Overseas and the Office National Anti-Acridien of Paris. The Western Region has not yet been affected by the present plague of the Desert Locust, but this conference will undoubtedly result in closer coordination of control operations, when the need arises, and of locust research.

Mediterranean Plant Protection Conference

A conference convened by the European Plant Protection Organization (EPPO), to consider plant protection problems of special interest to countries in the Mediterranean region, was held in Palermo and Catania, Sicily, 20–23 October 1952. Nine Governments – Algeria, Cyprus, France, Israel, Italy, Libya, Morocco, Tunis and Yugoslavia were represented. The staff entomologist of FAO attended in the capacity of observer.

The conference agreed on the following list of pests and diseases which have not so far been recorded in the Mediterranean area, and the introduction of which would cause grave damage to the citrus and fruit industries of that area and to international trade:

Spiny citrus whitefly (*Aleurocanthus woglumi* Ashby),
Mexican fruit fly (*Anastrepha ludens* Loew),
Oriental fruit fly (*Dacus dorsalis* Hendel),
Pink disease (*Corticium salmonicolor* Berk and Br.),
Tristeza, or quick decline of citrus,
Citrus canker (*Xanthomonas citri* Dows.),
Pierce disease of the vine.

In each case the delegates agreed to make recommendations to their governments concerning measures to be adopted in an endeavor to prevent the above pests and pathogens from entering their territories.

The main subject of discussion at the conference, however, was the Mediterranean fruit fly (*Ceratitis capitata* Wied). There was a full exchange of views on the scientific and economic problems created by the presence of this destructive pest which is prevalent throughout the Mediterannean area. The conference agreed that more research on the various phases of the insect is needed and should be undertaken in the various countries. The EPPO secretariat assured the delegates that it was planning to convene meetings of specialists from time to time to discuss progress and to coordinate effort.

The delegation from Cyprus raised the question of the risks involved in the importation in quantity of grapevine cuttings into a phylloxera-free area such as Cyprus. One view was that the pest creates such havoc in the vineyards that only small quantities of cuttings should be imported, and only through government channels and released after adequate observation under quarantine conditions.

Against this view, it was pointed out that one-year old cuttings could not carry the eggs of the pest, and that if importation was strictly limited to cuttings of this age there was no risk of introducing phylloxera although as additional precaution the cuttings should be dipped in an ovicidal solution such as the heavy oils.

There was also a brief discussion on biological control of insects. The view was expressed that there exist conflicting ideas regarding the depen-

dence of insect control on parasites alone, and in the adoption of a combination of biological and chemical control. It was further pointed out that there exists considerable doubt with regard to the desirability of establishing an international centre to deal with biological control problems. The conference concluded that this problem is of such a nature that only an organization such as FAO could undertake to clarify the situation and seek the proper solution.

A report on the conference will be published as soon as possible by EPPO.

Roma - Tipografia del Senato del dott. Giovanni Bardi

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